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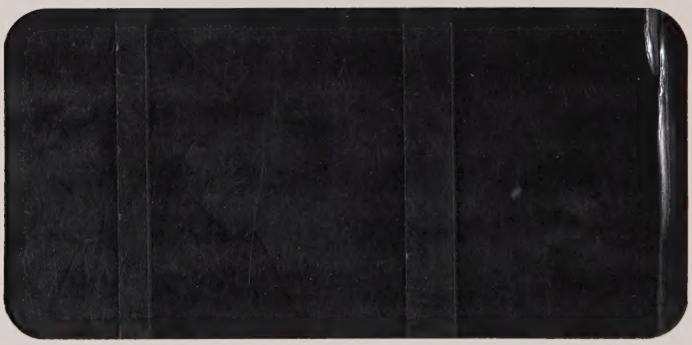
"NOTE"
Applicable
TO MANY
Temp. Chambers

TEMPERATURE CHAMBER MANUAL

DELTA DESIGN
INC

SAN DIEGO, CALIFORNIA

MP MASTER
MA32454



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TEMPERATURE CHAMBER MANUAL

This manual is applicable to the following temperature chambers:

MODEL Nos. 1807, 1809, 1811, 1813, 1815, 1817, 1819, 1821, 1823
2505, 2507, 2509, 2511, 2513, 2515
3501, 3503, 3505, 3507, 3509, 3511
5705, 5707, 5709, 5711, 5713, 5715
6901, 6903, 6905, 6907
5301, 5303, 5305, 5307

MODEL Nos. 1808, 1810
1812, 1814, 1816, 1818, 1820, 1822, 1824
1826, 1828, 1830, 2506, 2508, 2510, 2512
2514, 2516, 3502, 3504, 3506, 3508, 3510
3512, 5706, 5708, 5710, 5712, 5714, 5716
6902, 6904, 6906
5302, 5304, 5306, 5308

TEMPERATURE CHAMBER SCHEMATIC

LOW RFI, 120-V SYSTEM

DELTA DESIGN INC
5725 KEARNY VILLA ROAD, SAN DIEGO, CALIFORNIA · TEL (714) 292-5000 · TWX: (910) 335-1215 · CABLE: DELTA

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OPERATION AND MAINTENANCE MANUAL

DELTA DESIGN, INC. TYPE II CHAMBERS

DESCRIPTION

CHAMBER: The Delta Type II Chambers are precision environmental temperature test units having stainless steel interiors, fiberglass insulation and aluminum outer cases. Heat is supplied by bobbin wound nichromeheating elements. A mercury power plunger type relay keys power to the heaters on command of the Solid State Controller. A solid state switch assembly (incorporating silicon controlled rectifiers) replaces the power relay in "Low RFI" type chambers.

The chamber is cooled by injecting liquid CO_2 (or liquid nitrogen in LN_2 models) into the air stream through an expansion nozzle. The coolant flow is metered by an AC operated solenoid valve. A silicon controlled rectifier solid state switch keys the solenoid coil on "Low RFI" type chambers.

SOLID STATE CONTROLLER: The controller compares the resistance of the temperature probe to the resistance of the TEMPERATURE SET POTENTIOMETER. (The resistance of a remote programming resistor is compared to the probe resistance if the MODE Switch is in the PROGRAM position).

The resistance of the probe will always be less than, equal to, or greater than the resistance of the TEMPERATURE SET POTENTIOMETER. These three situations directly correspond to the chamber temperature being lower than, equal to, or higher than desired. The controller applies heat, coolant, or withholds both to obtain and maintain the selected temperature in the chamber.

NOTICE: The controller is a three mode unit, i.e.

(a) Heat only
(b) No heat or coolant
(c) Coolant only

This mode of control insures that LCO_2 and LN_2 is not wasted in a continuous cycling of the heaters and coolant valve such as would be the case for a simple two state output controller.

RF Noise Suppression as Applicable
The power Contactor (relay) is replaced by a Solid State switch and a small solid state switch is utilized for keying power to the CO_2 valve solenoid. A Line Filter is added to reduce the conducted noise.

CHAMBER MODEL DESCRIPTION

Model No. Series	Description
1800 Series	1/3 cu. ft. test volume chamber with a 60 CFM blower to provide air circulation. Temperature range of -100°F to +600°F Heater Wattage: Slow Heat Models - 700 Watts Fast Heat Models - 1400 Watts
2500 Series	1/2 cu. ft. bench mounted chamber with 60 CFM blower and temperature range of -100°F to +600°F. Heater Wattage: Slow Heat Models -700 watts Fast Heat Models -1400 Watts
5300 Series	An especially designed chamber for use with microwave, centrifuge and vibration machines. It is a 1-1/2 cu. ft. size with a door on the front; 140 CFM blower; a control mounted on the bottom front; a programmer receptacle on the front panel and the failsafe switch and light are located on the front. Two access ports on the right and left hand side are provided for the microwave plumbing. A 1/2" diameter CO_2 vent is located on the left side of the chamber and carrying handles are provided on the top of the chamber. Additional holes, or ports, may be cut in the doors, plugs, sides or top of the chamber. Control accuracy is 1/2°F. for this chamber. This chamber is also available with the controls mounted at the top front.

Heater Wattage: 1400 Watts

5700 Series 1-3/4 cu. ft. volume capable of accepting rack mounted instruments for temperature testing. Two 60 CFM blowers provide air circulation. Electrical access to the equipment being tested is provided on the left hand side of the chamber in the form of a 1-1/2" diameter feedthrough.
Heater Wattage: 5701 thru 5716 - 1400 watts
5717 thru 5728 - 2800 watts

7200 Series 3-1/2 cu. ft. chamber especially designed for use with microwave, centrifuge and vibration machines. Two 140 CFM blowers provide air circulation. Door hinged on front with control located at top front of chamber. Temperature range of -100°F to +300°F. Heater wattage: 2800 watts.

7600 Series 5-3/4 cu. ft. chamber with a left hand, hinged front door and a removable bulkhead on the rear. The control and associated valves are located on the base of the chamber. Six 140 CFM blowers provide a horizontal low gradient air flow. Three 1/2" diameter holes are located in the upper rear of the bulkhead. One hole is used for a CO_2 vent and the other two for electrical access to the chamber. The failsafe light and adjustment switch are located on the left hand side of the chamber and the programming plug is located on the front control panel.
Heater wattage: 4200 Watts

OPERATING INSTRUCTIONS

Load the test area or drawer and insert it into or close the door as the case may be. Latch the drawer (door) into place by pressing firmly on the two handles so that the handle latch will catch under the two door strikes. Depress levers until latch drops which indicates the drawer (door) is in place. The handle latch can be released by raising the release buttons located on the top of the handles.

Plug all the unused feedthru sleeves with the corks or plugs provided except the CO_2 vent. After plugging the power cord into a 120 volt 60 cycle single phase, three wire grounded outlet (240V 60 cycle single phase three wire grounded outlet, as case may be), turn the power switch on. The blowers will start and continue to run while the chamber is in use. The white pilot will glow continuously.

Place the HEAT Switch to the ON position. Set the MODES Switch to the MANUAL position. Place the COOL Switch in ON position if coolant is connected.

The TEMPERATURE SET dial should be set to the number corresponding to the desired temperature in °F.

The red HEAT lamp glows continuously until the setpoint temperature is approached and as temperature is approached, the heat anticipator in the bridge circuit prematurely balances the circuit, turning the heat off and causes the red heat lamp to turn off. A cycling occurs as the temperature reaches its setpoint and is indicated by the cycling red light.

As the chamber stabilizes, the cycling rate decreases and becomes more rhythmic. This unique rate action is achieved by unusual anticipators which force this type of action when a change in setpoint is made; but when stabilization is reached, the anticipation effect is reduced to a negligible amount.

When the test is finished, do not turn the POWER switch OFF but turn the CONTROL or HEAT switch off, allowing the chamber to cool down to 150°F. before turning the POWER switch OFF. This allows the blower to run so that

no hot spots will develop within the chamber and damage the chamber components. To cool rapidly, operate the chamber as described under the heading "Operation at Low Temperatures".

Room Temperature

For operation around ambient, both the HEAT and the COOL switches should be turned ON and coolant connected. The temperature may then be dialed on the TEMPERATURE SET control to any position (ambient, hot or cold), and the chamber will automatically go to the proper temperature.

Operation at Low Temperatures

The comments on operating the electrical system of the chamber at "Low Temperature" apply equally as well to the operation for "High Temperature".

The Dial is direct reading. The green pilot light will remain on as long as the temperature is above the set-point. The control will cycle on and off as with high temperature operation. A cool anticipator is also used to better match the control characteristics of the CO_2 operation. The chamber may be rapidly warmed by removing the drawer and letting the blower run or by operating as described under High Temperature.

Low Temperature Liquid CO_2 Cooling

Obtain a 50 lb. 900 psi syphon-type liquid CO_2 bottle and perform the following test:

Place a white handkerchief or towel in front of the bottle nozzle and release a small amount of CO_2. If a brown stain appears on the cloth, the bottle contains water and rust which will either freeze the valve in the open position or clog the injector nozzle. If the cloth becomes oily the CO_2 will deposit oil on components being tested and will cause the chamber to smoke when heated. If the spray leaving the nozzle of the CO_2 tank is not a dense, white cloud, but more of a thin, gray stream, the tank is almost empty and should not be used for controlling the temperature of the chamber.

After having determined that the bottle to be used is in

proper operating condition, attach it to the chamber with the high-pressure hose and fittings provided with the temperature chamber. If the hose has been disconnected from the system for a while, clean it out with a burst of CO_2 before connecting it to the chamber. A Sealing compound should be used on the fittings to prevent liquid leakage. Open the bottle and check for leaks in the hose or in the valve itself. Frost appears where leaks occur. Not only do leaks cause high loss of liquid CO_2 but often cause fluctuation of chamber temperature.

Optional Low Pressure System

When the in-plant use of liquid CO_2 exceeds a certain amount (usually around 1000 to 2000 lb. per month), a 300 psi bulk liquid CO_2 storage system maybe installed to reduce the CO_2 cost. At the time of this conversion, the chambers should be retrofitted with a 300 psi valve and injector assembly, obtained by contacting the NLS representative. When ordering new chambers, use with the 300 psi system should be specified at the time of order placement.

NOTE--

> When a 300 psi system is used with a Delta chamber, the CO_2 supply should be of the recirculating type, if possible. If not of this type, the supply should be located as close as possible to the chamber to minimize gas formation in the line. This is very important in low volume usage as the system is totally dependent upon the insulation and fluid flow to prevent boiling CO_2 in the supply line. Gaseous CO_2 is not an effective coolant.

Meticulous cleanliness is required. All lines, valves, and connecting hoses up to the chamber should be blown out thoroughly before the chamber is connected. The entire system and each new charge of CO_2 should be free of rust, water, and other matter. Water is very troublesome and is apparently inherent in some low-pressure refrigerated supplies. If lines are open to bleed off excessive pressure at shutdown, they should immediately be closed

to prevent contamination by condensed moisture. This will help to prevent the formation of ice on the control valve.

Liquid Nitrogen Adapters
Operation at -100°F

Liquid Nitrogen is a refrigerant which is becoming more popular and less costly. In those plants which use this refrigerant exclusively, it is economical to use it for cooling temperature chambers to -100°F. A kit can be supplied for use in all chambers. It consists of an insulated box containing two valves in parallel. The chamber modification consists of a ceramic feedthroughand a special socket wired in the back of the chamber. A 1/4' stainless flared tube fitting with insulating ring attachment is provided for coupling to the LN_2 source. Tow switches are provided on the side of the adaptor. The left selector switch allows the use of the standard CO_2 injector system, the liquid Nitrogen injector system, or to have both systems inoperative. The right hand switch in the "Start" position energizes both solenoid valves (when the chamber control is calling for refrigerant) and the "Run position" allows only one to be energized. The "Start" position is used where the transfer lines between the storage tank and the chamber is long. This allows a large gas accumulation in the line which must be scavenged before cooling takes place. CAUTION:

NEVER LEAVE SOLENOIDS ENERGIZED WITHOUT COOLANT FLOWING, as the coolant provides a necessary cooling action to the valves.

When shutting down a system never shut off both the LN_2 injector and supply tank as this leaves the transfer line unprotected by a relief valve unless an additional one is installed. The LN_2 trapped in this manner slowly gassifies exhibiting tremendous pressures.

Operation at -200°F

The operation of the LN_2 injector is the same as for -100° F. type. This injector can only be used with appropriate chambers and in each case requires a controller or probe of special range, moisture proofing of the controls and wiring and a heating unit placed between the impeller and the motor to prevent freezing of the motor bearings.

The chamber when approaching -200°F. may discharge some excess LN_2 under the door gasket but upon starting control at -200°F. this should stop. The chamber will sweat or condense the moisture out of the air on the surface when operated for prolonged periods at this low temperature but this should not affect the operation of the chamber.

The 7600 chamber has two units to provide enough flow to maintain -200°F. in this large a test volume.

Step Programming

Chambers can be cycled between a high and low setting with the aid of a 9307 HI-Lo Programmer or 9311 10 step programmer. A 9312 Hi-Lo Ambient provides MIL STD 202B testing capability.

Rate Programming

Chambers may be step programmed or rate programmed over their entire operating range. The Delta 9305 Rate Cycling Programmer has been developed along with auxiliary modules to provide flexible programming for the unit.

PROGRAMMING RESISTOR FOR REMOTE PROGRAMMING:

The value of the programming resistance (connected across the program input) determines the temperature the chamber will reach when the MODE switch is placed in the MANUAL position. The approximate value is selected for a desired temperature as follows:

1. Determine the desired Temperature Span which is defined as the number of degrees the desired temperature is to be raised above the lowest possible setting of the chamber Temperature Set Dial (either -100° or -200°F.).

   Example: (a) Desired program temperature 150°F
   (b) Lowest chamber temperature -100°F
   (c) Temperature Span 250°F (-100°F to +150°F)

2. Multiply the temperature Span by 0.44 ohms/F° to obtain the approximate value of programming resistance.

Example: Program resistance to obtain desired temperature of 150°F
Desired Temperature Span (250°F) multiplied by 0.44 ohms/F°
250°F x 0.44/°F = 110 ohms

Failsafe Control

A screwdriver adjustable over-ruling thermostat, capable of limiting temperature operation at any selected point between approximately +200°F., and +600°F., is accessible through a hole on the rear panel of the chamber. To set this thermostat, the chamber is operated at the desired temperature and the adjustment made until the indicator lamp glows, indicating that the thermostat is open, thus turning off the heater. The temperature at which the failsafe is set should be noted for future reference so that when lower or higher temperatures are set in, the control can be re-set.

Routine Maintenance

Very little routine maintenance is required for Delta chambers. The following is recommended on a routine basis depending on the degree of usage, but should be performed at regular intervals.

Insulation

Prolonged use at low temperature will eventually reduce insulation efficiency due to condensed moisture. An occasional run at elevated temperature will cure this condition.

Blowers

The blower motors provided with the chamber are thermally insulated from the chamber heat but require occasional oiling in order to insure long life. Normal usage demands lubrication at least once a month or more frequently if continous use of the chamber is made. A couple of drops of oil in each oil cup are sufficient for normal usage. The recommended oil is a high temperature, high speed spindle oil (DUMORE 500-011 or equal). The oil cups are located at the rear of the chamber and extend through the grill covering over the motor housing.

Cleanliness

Since LCO_2 syphons occasionally have oil vapor contamination, it is recommended that the chamber inner liner be wiped frequently to reduce smoking at higher temperatures.

Recommended Procedure When Using Low Temperature LCO_2 Cooling

Place a white handkerchief or towel; in front of the bottle nozzle and release a small amount of CO_2. If a brown stain develops on the cloth, the bottle contains rust contamination which is likely to clog the filter and solenoid valve in the chamber. If the handkerchief becomes wet, the bottle contains water which will either freeze the valve in the open position or clog the injector nozzle. If the spray leaving the nozzle of the CO_2 tank is not a dense white cloud, but more of a thin, gray stream, the tank is almost empty and should not be used for controlling the temperature of the chamber. Having determined that the bottle to be used is in proper operating condition, attach it to the chamber with the high pressure hose and fittings provided with the temperature chamber. If the hose has been disconnected from the system for awhile, clean it out with a burst of CO_2 before connecting it to the chamber. A sealing compound should be used on the fittings to prevent liquid leakage. Check for leaks in the hose or in the valve itself. This can be located by a frosting of the hose or the fittings where such leaks are occuring. Not only do these leaks cause high loss of liquid CO_2 but often cause fluctuation of temperature in the chamber.

Meticulous cleanliness is required. All lines, valves, and connecting hoses up to the chamber should be blown out throughly before the chamber is connected. The entire system and each new charge of CO_2 should be free of rust, water and other matter. Water is very troublesome and is apparently inherent in some low-pressure refrigerated supplies. If lines are open to bleed off excessive pressure at shutdown, they should immediately be closed to prevent contamination by condensed moisture. This will help to prevent the formation of ice on the control valve.

Gaskets

The gaskets being silicon rubber will cause very little trouble. However, if excessive CO_2 gas leakage occurs around the door openings, replacing the gaskets will prevent this condition.

SPECIFIC DESCRIPTIVE DATA AND MAINTENANCE INSTRUCTIONS

Blowers

The blower motors provided with the chamber are thermally insulated from the chamber heat but require occasional oiling in order to insure long life. Normal usage demands lubrication at least once a month, or more frequently if continuous use of the chamber is made. A couple of drops of oil in each cup are sufficient for normal use. The recommendedoil is a high temperature, high speed spindle oil (Dumore 50-010 or equal). The oil cups are located on the motor and extend through the grill covering over the motor housing. (No oiling necessary on Model 6900).

All chambers with a temperature range -100° to 600°F. have (2) two 1/16" asbestos paper gaskets glued to the blower assembly mounting plate facing the main blower cage. The outer of the two gaskets shall seal tight on the shaft to prevent heat or CO_2 from entering into the motor.

All chambers with a temperature range -200°F to 600°F. have a 40 watt resistance heater sandwiched between (2) two 1/16" asbestos paper gaskets glued to the blower assembly mounting plate facing the main blower cage. The outer of the two gaskets shall seal tight on the shaft to prevent the chill of CO_2 or LN_2 from entering the motor. This motor heater is on while chamber is in cooling process to keep the bearings from freezing.

The blower motor may be removed for replacement or overhaul by removing the screws from the grilled covering over the motor housing area. The wires may be disconnected by removing the wire nuts and the motor assembly withdrawn from the chamber by loosening the two-slotted head screws which attach it to the chamber. No attempt should be made to disassemble the two nuts which hold the motor blower assembly together. When the screws have been loosened the entire assembly may be withdrawn from the chamber. This unit may then be sent back to the factory for replacement or repair.

Controller Calibration

Actual calibration is accomplished by adjusting the setting of the 200 ohm trimpot located on the printed circuit board adjacent to the 1-1/2" x 1-1/2" rectangular metal can. Turning the adjustment one turn clockwise increases the temperature in the chamber approximately 20°F. Counter-clockwise rotation of the trimpot decreases the temperature in the chamber.

The gain of the controller is increased by adjusting the 500 ohm trimpot clockwise and is decreased by turning the control counter-clockwise. Decreasing the controller gain increases the "deadband". The trimpots should never be adjusted indiscriminately or left in their full counter-clockwise position. Always turn them at least 1 turn in. This insures that the trimpot will not be left in a position that could result in intermittent changes in its effective resistance.

Low RFI Chambers Only

The Heat Solid State Power Contactor assembly consists of two SCR's (silicon controlled rectifiers) connected in a reversed parallel arrangement to each other and in series with the heaters and the source of AC power. 1/2W resistors and diodes associated with the gating circuit for the SCR's are located on a P.C. board near the assembly.

The reed relays, mounted on the controller P.C. board key the SCR power contactors for both heat and cooling. Negligible current is carried by the relay contacts (only SCR gate turn-on current) which is in the order of milliamperes. As soon as either of the SCR's turn on, all voltage is removed from the relay contacts. This action insures that voltage is never present across the reed relay contacts when they open. The SCR's continue to conduct until the actual load current approaches zero magnitude. A contact protector is connected across the reed relay contacts to protect the SCR's from any high voltage transients that might occur on the AC power line. The contact protector will start to conduct current when a high voltage transient is impressed across it and its' conduction turns on the SCR for the remainder of the 1/2 cycle of line voltage. This action insures that the

SCR will not be required to block damaging high voltage line transients.

The CO_2 valve is energized by a Solid State Contactor circuit consisting of a single SCR and a full wave diode bridge. The SCR and diode bridge combination has essentially the same characteristics as the dual SCR configuration used in the heat circuit. The use of an SCR diode bridge circuit to key power to the CO_2 valve has the property of never interrupting the circuit until the current flowing in it approaches zero. This action insures that the solenoid circuit is not interrupted when current is flowing in the inductive load consisting of the solenoid coil. This provides and insures radio noise free operation of the CO_2 solenoid valve.

Control Panel
Models 5300, 6700, 6900, 7200 and 7600

The control panels of these type chambers may be removed by removing the corner screws of control front panel. The probe extension wires are removed from the Jones block, control package lifted from the chamber and the connecting plug disconnected.

Models 1800, 2500, 3500 and 5700

The control panel for these types of chambers are removed by taking out the four corner screws and then unplugging the control panel. The probe is mounted on the control package. Two adjustments are accessible in the control assembly and are 1) deadband adjustment and 2) temperature offset.

The gain (deadband adjust) is a 20 turn trimpot located on the P.C. board. Its value is 500 ohms and as such can be identified. Turning the pot adjustment counterclockwise decreases gain to increase deadband. Clockwise rotation increases gain to as to reduce deadband. The only time deadband should be increased is if the control continually cycles between heat and COOL -- (first one coming on and then the other) -- deadband is increased to stop the cycling.

The temperature offset trimpot is used to shift the actual temperature of the chamber with respect to what

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is set on the setpoint dial. Turning the trimpot (200 ohms) clockwise one turn, increases the actual chamber temperature approximately 20°F.

Dial Calibration

The skirted dial assembly should be located on the shaft of the single turn potentiometer so that when indicating 250°F (for 600°F maximum dial temperature) the pot is at the center of its resistance. The dial assembly stop is held against the panel by the potentiometer mounting nut. The stop should be positioned so as to permit the setpoint to be turned aproximately 15° past each of the two limits.

Power Contactor (Mercury Plunger Relay)
Models 1800, 2500, 3500, 5700 & 6900

If it should become necessary to replace the power relay, the back panel is removed as described above and the relay bracket is removed from the heat shield panel located on the left hand side facing the rear of the chamber. The CO_2 valve electrical connections are removed by undoing the wire nuts. The relay is then removed from the chamber. The new relay bracket assembly is then replaced and the CO_2 valve connections re-made. The back panel is then replaced exercising care in alignment of the failsafe light and switch.

Model 5300

The relays are located in top or bottom portion of the chamber in the same area as the control panel. They are reached by removing the top or the base unit as the case may be. They may then be removed from the bracket and the plug removed from the socket and a new one installed. The top or base may then be installed.

Model 7600

The control panel is removed from the pedestal of the chamber and the front cover plate to the pedestal is also removed exposing the power relay on the left hand side. The relay may be withdrawn from the chamber and replaced with a similar unit. The front pedestal cover and control panel are then replaced.

FAILSAFE

Standard TEmperature Ranges
Models 1800, 2500, 3500, 5700, 6700, 6900 and 7600

Should the failsafe or associated light require replacement, the procedure to uncover the assembly is the same as described for replacing heaters. Two screws and two electrical connections retain the assembly to the chamber inner liner near the heater assembly. These assemblies are located on the rear of the chamber with the exception of Model 7600 which is on the left hand side of the chamber.

Models 5300 and 6900

The failsafes on these chambers are located on the front panel of the chamber and may be replaced by removing the front cover; removing the insulation in the area surrounding the failsafe switch and removing the two screws and two electrical connections retaining the assembly to the chamber. The opposite procedure is used for replacing the failsafe.

HEATERS

Models 1800, 2500, 3500, 5700 and 6900

When it becomes necessary to replace a heater assembly, the back panel of the chamber is removed. It is not necessary to disconnect the power cord as the back panel will swing out of the way. The center portion of the insulation is removed. The wires and the two screws are removed from the mounting assembly. Theheater assembly may then be removed. For Model 5700 chambers, two heaters are used. Some models have dual heater assemblies. The new heater assembly is then installed by reversing the above procedure. Care should be taken when re-installing the back panel that the failsafe adjustment and light are properly aligned with the holes in the back panel.

Model 5300

The heaters are located in the same area as the controls, thus if the controls are on the top, the top cover is

removed. If the controls are on the bottom, the base unit is removed. The insulation is withdrawn from the area surrounding the blower motor thus exposing the heater assemblies. The heater assemblies are replaced in a similar fashion to that described in preceeding paragraphs and the inverse procedure followed to reassemble the chamber. On these particular chambers a series parallel connection is made as shown on the schematic and care should be taken in re-making the electrical connections to the new heater assemblies. These haater assemblies are dual assemblies used in other type chambers, however, only one half of the voltage is impressed upon them, thus they run at a lower temperature. Care should be taken in re-installing the heater assemblies. Erratic temperature control under ambient conditions will be noticed if these directions are not followed.

Model 6700

To obtain access to the heaters on the 6700 Type Chamber, the control panel must be removed; the cover over the control area is removed and the connections to the wires which enter the chamber from the terminal board are removed from the terminal board. The back cover of the chamber is then removed, the insulation is taken away from the area surrounding both blowers and the heaters are thus exposed. The heater assemblies are replaced as described in preceding sections and the same precautions should be made in re-wiring the heaters as described under type 7600 description.

Model 7600

The top cover of the 7600 Type Chamber is removed to obtain access to the heaters. The screws around the top and two sides of the front and back panels and the screws along the base on both sides attaching the cover to the base are removed. The cover is withdrawn from the top and the insulation is removed from the sides, thus exposing the heater assemblies.

The wires retained by nuts and the two screws retaining the assembly are removed and the heater assembly is then removed and replaced. Once the wires have been replaced on the heater assemblies and the insulation replaced, the cover is replaced from the top and secured with the

screws. Care should be taken in making the electrical connections. The appropriate wires should be connected to the proper terminals as designated by the schematic.

Insulation

Prolonged use at low temperature will eventually reduce insulation efficiency due to condensed moisture. An occasional run at elevated temperature will correct this condition. All high temperature and 5300 type models will steam or drip moisture when heated up after prolonged periods of non-use, particularly in moist climates. This effect is natural but necessary for best performance.

All chambers except 5300 and 7200 series use a fiberglass type filler. Models 5300 and 7200 use a high temperature solid material that is easily cut to add additional openings to the chamber.

Probe

Carefully observe the position of the probe before removal. Loosen the setscrew holding the probe in the guide tube. Slide the probe out and remove the connecting wires. When re-installing the probe carefully return it to its original position within the guide tube. If this precaution is not observed, recalibration of the chamber may become necessary.

Solenoid Valves
Models 1800, 2500, 3500 and 5700

To remove the valve, remove the screws holding the back panel so that it can be tipped aside (it is not necessary to disconnect the wiring). Remove the two sections of insulation from between the heat shield plate and the chamber liner. Disconnect the solenoid by removing the screws and two wire nuts and by withdrawing the solenoid toward the rear so that the injector tube is withdrawn from the chamber. To install the solenoid valve, place the injector tube into the inner liner through the hole provided and carefully bend the tube so that it goes into the slot on the heat shield on the back portion of the chamber. The solenoid valve is then secured to the heat shield bracket on the chamber with the screws and connected electrically with the two wire nuts. The

insulation is then fitted back into place and the back panel reassembled.

The position of injector inside the chamber should be checked to see that the top jet strikes approximately half way down probe. This is easily done by removing the inner right hand baffle and observing when operating as described in "Low Temperature".

Models 5300 & 7200

The 5307 and 5308 chambers have the controls and CO_2 valve located in the bottom of the chamber whereas the 5302, 5303, 5304, 7203 and 7204 have the controls and CO_2 valves located in the top of the chamber. Access to these areas may be had by removing either the base or the top cover respectively. The valve may then be removed from its bracket; the wire nuts disconnected and the injector tube withdrawn from the chamber through its appropriate guide tube. The injector is secured on the inside of the chamber by a clamp located near the blower intake. This should be loosened before the tube is withdrawn. The reverse procedure is used to re-install a new valve and injector tube. Care should be taken in placement of the injector nozzle in that it should be positioned to spray into the open squirrel cage of the blower intake and be in such a position that it aids in the direction of the blower rotation. Otherwise, when cycling at cold temperatures the force of the CO_2 impinging on the impeller will slow the blower, thus overloading the motor and giving erratic performance.

Model 6700

The CO_2 valves are located at the rear of the chamber in the control area. The control is disconnected electrically by removing the plug located on the back side of the controller and then the cover, retained by the screws around its top and bottom edge -- when removed it exposes the two areas where the CO_2 valves are located. One at the top right of the chamber and the other at the lower left of the chamber. The extension tubes on the valves are removed with an appropriate wrench. The valves may then be removed from the chamber by uncoupling the wire nuts which secure the electrical

connections and the screws which retain them to the chamber. Since the guide tubes position the CO_2 injectors in the correct position, the only precaution to be made in inserting the injector tube is to ascertain that the correct length has been inserted into the guide tube so that the nozzle projects into the chamber. The valves are then mounted to the chamber on the appropriate brackets and the extension tubes to the base of the control area are re-inserted and the electrical connections madewith the aid of wire nuts.

Model 7600

The CO_2 valve which is located in the base at the rear of the chamber may be removed by loosening the retaining screws accessible through the open base of the chamber. The wire nuts are removed to break the electrical connection. To remove the injector tube, it is necessary to remove the top cover of the chamber which is secured by a row of screws on both sides of the chamber and the screws around the sides and top of the front and back panels. Once these screws have been removed and the cover lifted off from the top, the insulation is removed from the right side of the chamber. The injector tube is withdrawn through the hole in the solid insulating block and through the hole in the base of the chamber. To re-install the injector tube, it is suggested that a piece of tape be placed over the nozzle as the injector is threaded through the hole in the base of the chamber up through the insulation and up to the sheet metal inner liner. The tape must then be removed from the nozzle before inserting into the inner liner. The injector should be positioned within the chamber as viewed through the louvered slots on the inside of the chamber so that the spray is directed toward the center aperture and so that it blows across the blower outlet of the first blower. This is to give the proper distribution of the CO_2 throughout the work area of the chamber. The insulation is then replaced; the cover secured and the valve may then be re-installed in the base of the unit with the appropriate screws and wire nuts.

Gaskets

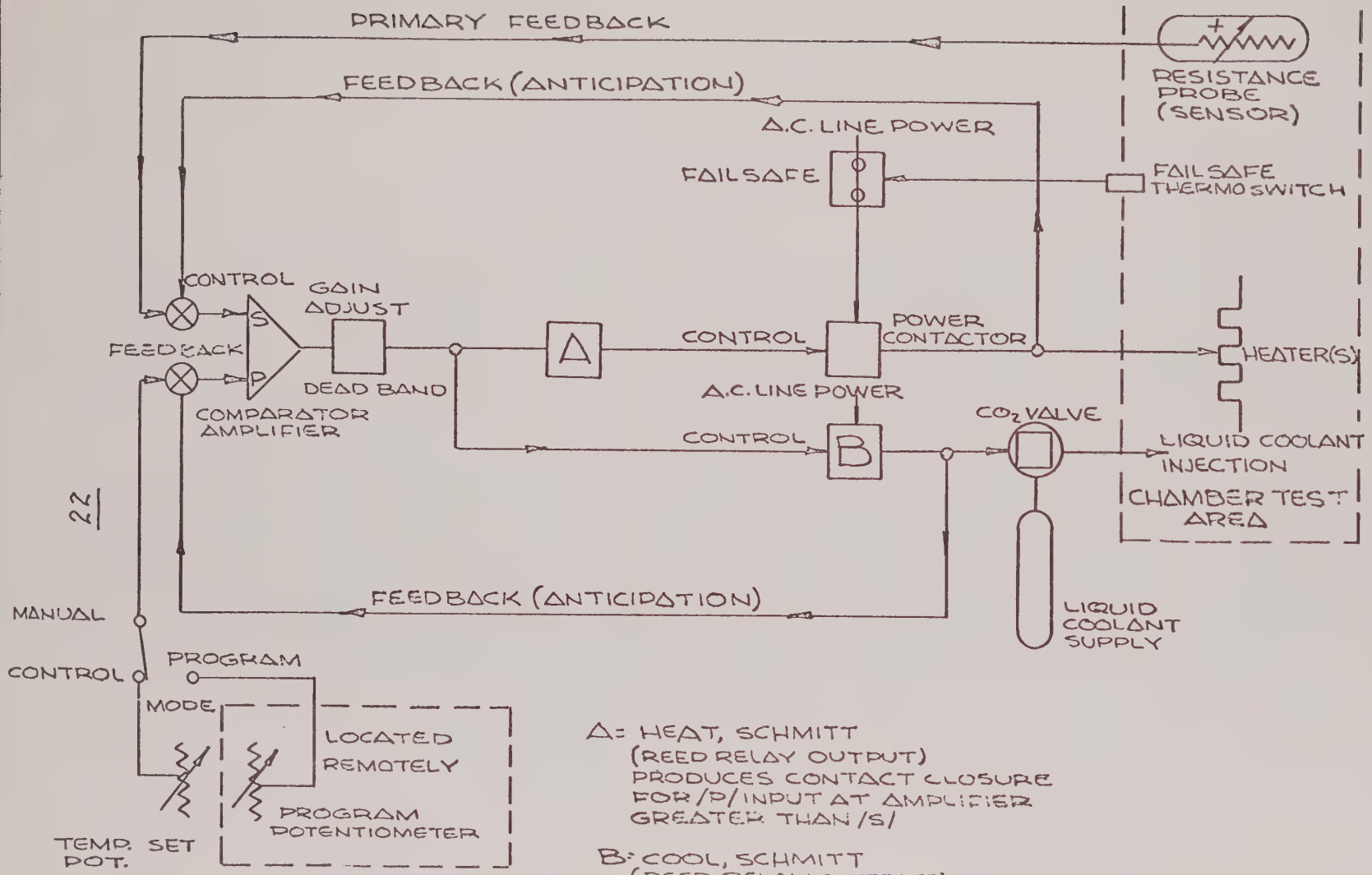
If excessive gas leakage is noted around the door or motor, particularly when using CO_2, and if the door is

properly seated, the gaskets should be replaced.

The Motor Blower is removed as is described under the sub-heading "Blowers". The asbestos gasket on the face of the blower assembly backing plate, which is located between the main blower cage and the motor cooling blower, may then be replaced. Two common causes of failure of this gasket are (1) plugging up of the CO_2 vent on the upper left side of the chamber and (2) turning the power switch off while the chamber is still hot.

To replace the flat, inner, door gasket, which is silicon rubber, first remove the screws that hold the retaining plate (and tray, if installed). The retaining plate (and tray) are then taken off the door assembly. The old gasket may then be removed and a new one substituted. The retaining plate (and tray) are replaced and the screws re-installed.

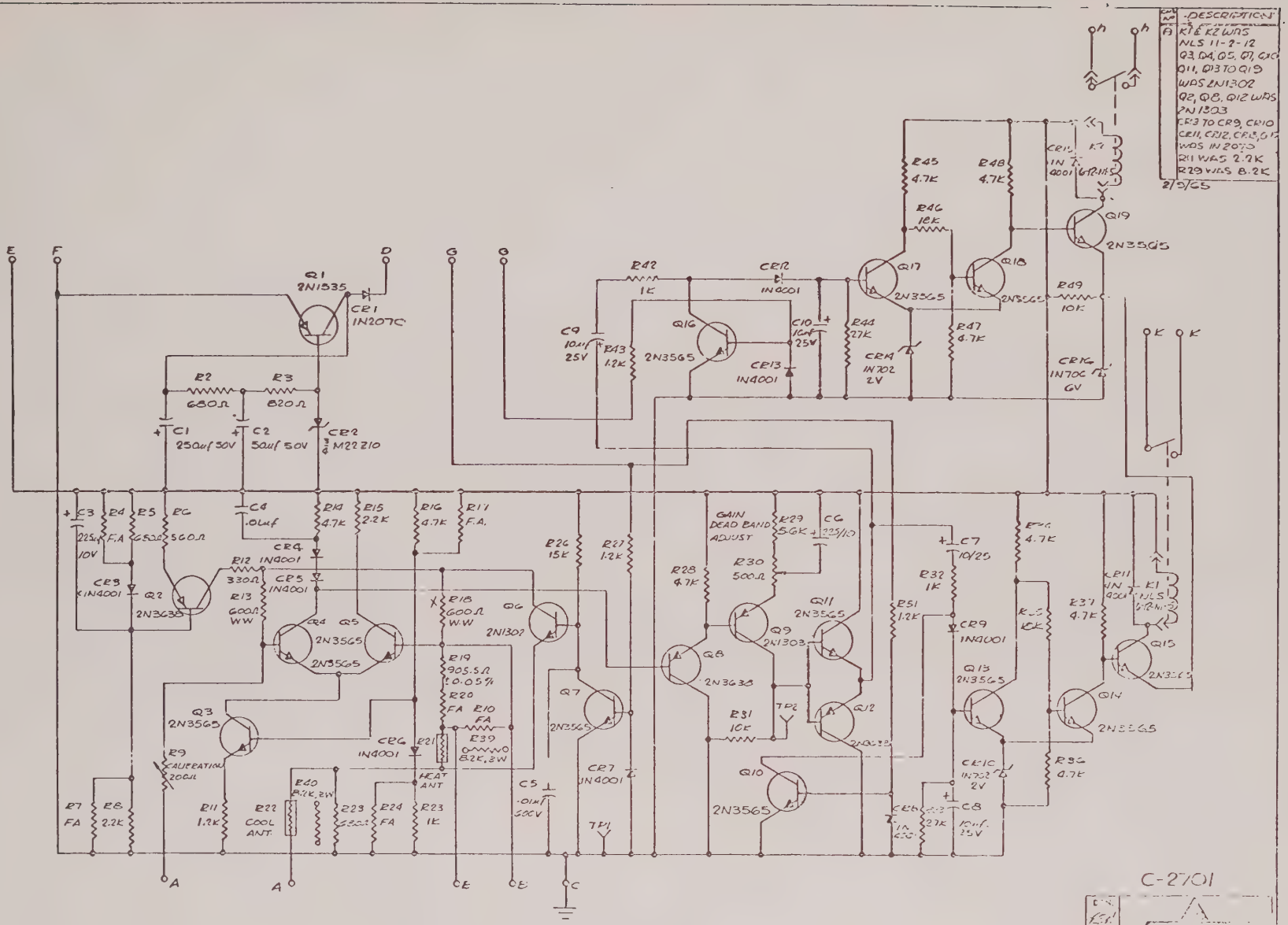
To replace the round outer, door gasket, first remove the screws that hold the front panel to the door assembly. The front panel may now be lifted from the rest of the door assembly. Remove the old "P" strip rubber gasket and install new one. Replace the front panel in the door assembly and replace screws.

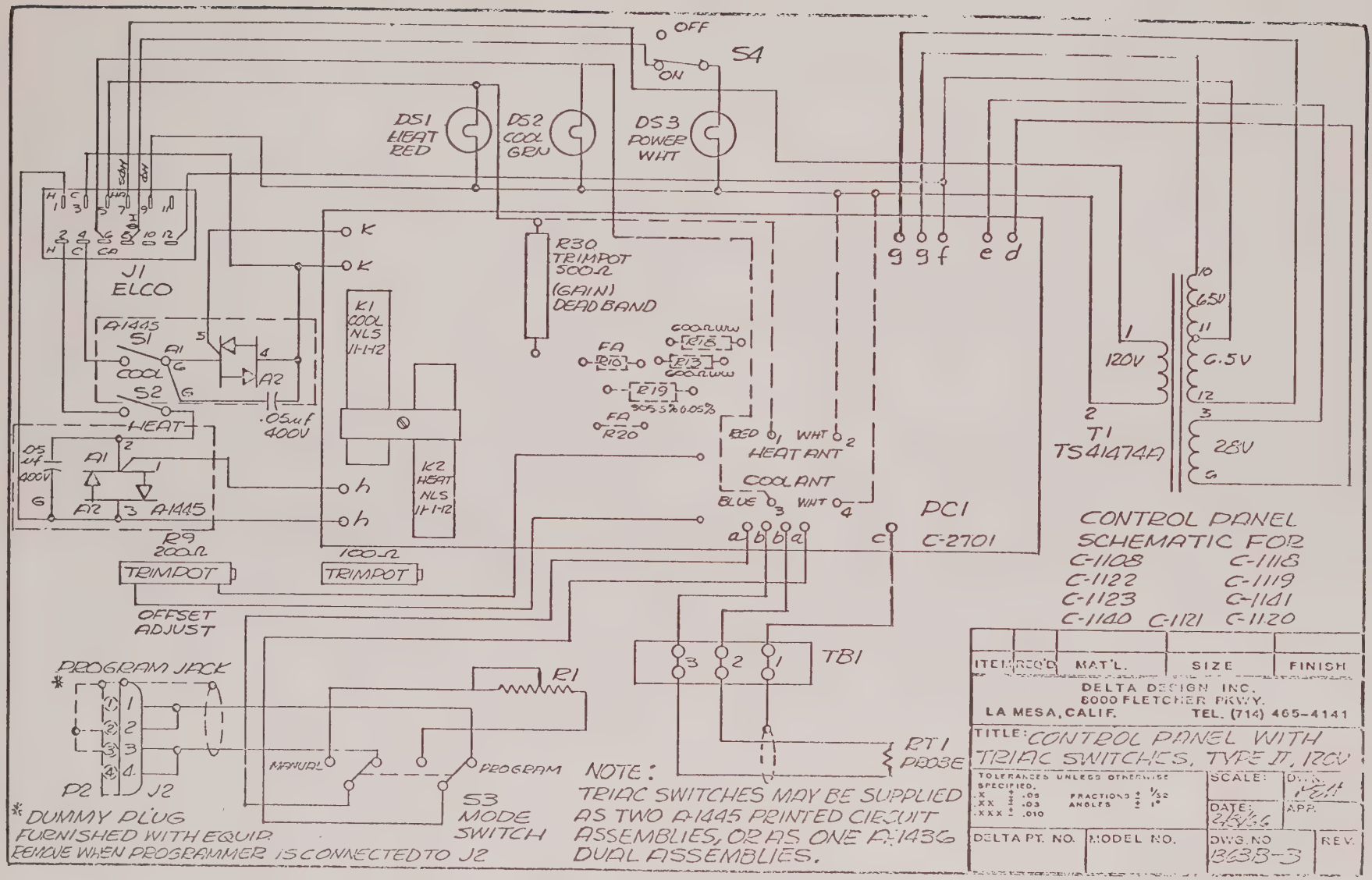


A: HEAT, SCHMITT
(REED RELAY OUTPUT)
PRODUCES CONTACT CLOSURE
FOR /P/ INPUT AT AMPLIFIER
GREATER THAN /S/

B: COOL, SCHMITT
(REED RELAY OUTPUT)
PRODUCES CONTACT
CLOSURE FOR /S/
GREATER THAN /P/

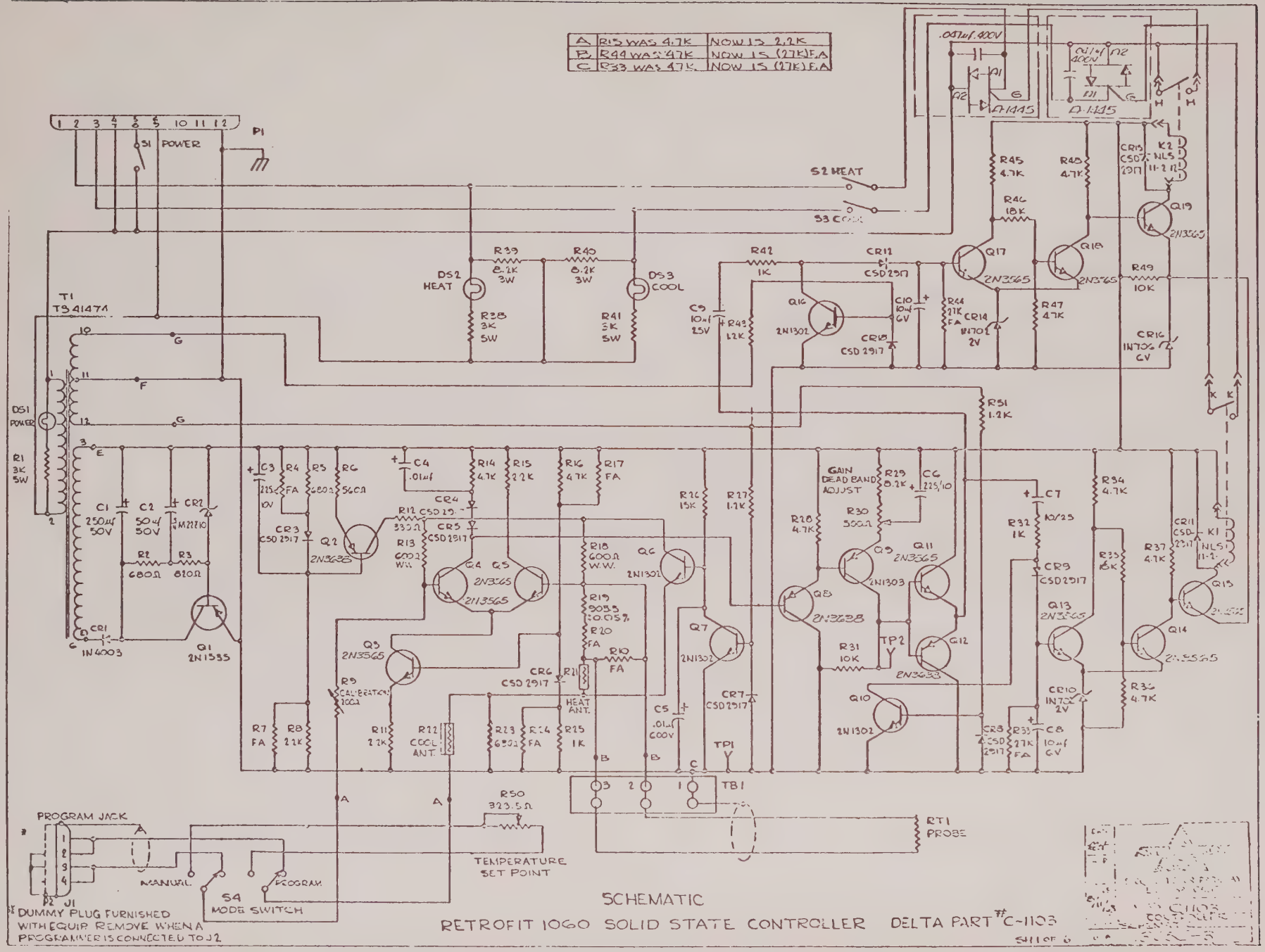
TEMPERATURE CONTROL
SYSTEM, SOLID STATE
TYPE II
DELTA DESIGN INC.
LA MESA, CALIF.


REV
DESCRIPTION
A
R16 R2 WAS
NLS 11-2-12
Q3, Q4, Q5, Q7, Q10
Q11, Q13 TO Q19
WAS 2N1302
Q2, Q8, Q12 WAS
2N1303
CR3 TO CR9, CR10
CR11, CR12, CR13, CR
WAS IN2070
R11 WAS 2.7K
R29 WAS 8.2K
2/9/65
Q1 2N1535
CR1 IN2070
R2 680Ω
R3 820Ω
C1 250uf 50V
C2 50uf 50V
CR2 M22210
C3 225uf 10V
R4 F.A
R5 680Ω
R6 560Ω
C4 .01uf
R14 4.7K
R15 2.2K
R16 4.7K
R17 F.A.
CR4 IN4001
CR3 IN4001
R12 330Ω
R13 600Ω WW
CR5 IN4001
Q2 2N3638
Q4 Q5 2N3565 2N3565
R18 600Ω W.W
Q6 2N1302
R19 905.5Ω ±0.05%
R20 FA
R10 FA
R39 820Ω, 2W
Q3 2N3565
R9 CALIBRATION 200Ω
CR6 IN4001
R21
HEAT ANT
R40 8.2K, 2W
C5 .01uf 500V
Q7 2N3565
CR7 IN4001
TP1
R7 FA
R8 2.2K
R11 1.2K
R22 COOL ANT.
R23 1K
R24 FA
R26 15K
R27 1.2K
R42 1K
CR12 IN4001
C9 10uf 25V
R43 1.2K
Q16 2N3565
C10 10uf 25V
CR13 IN4001
R44 27K
CR14 IN702 2V
R45 4.7K
R48 4.7K
R46 18K
Q17 2N3565
Q18 2N3565
R47 4.7K
CR15 IN 4001
Q19 2N3565
R49 10K
CR16 IN702 6V
K K
GAIN DEAD BAND ADJUST
R29 5.6K
C6 .22 1/10
R28 4.7K
R30 500Ω
Q11 2N3565
Q9 2N1303
Q8 2N3638
R31 10K
TP2
Q12 2N3638
Q10 2N3565
C7 10/25
R32 1K
R51 1.2K
CR9 IN4001
Q13 2N3565
CR10 IN702 2V
C8 10uf 25V
R36 4.7K
R35 10K
R37 4.7K
CR11 IN 4001
K1 NLS 11-2-12
Q15 2N3565
Q14 2N3565
R38 4.7K
E F D G G
A A E E C
R10 OPEN, R20 SHORTED, OMIT R19 WHEN TEMTECH PROBE IS USED
SCHEMATIC
P.C. ASSY II DELTA C2701 & A1059
C-2701
SERIAL Nº 520 & ON
SHT 1 of 2
DES NO. 111330-2



* DUMMY PLUG FURNISHED WITH EQUIP. REMOVE WHEN PROGRAMMER IS CONNECTED TO J2

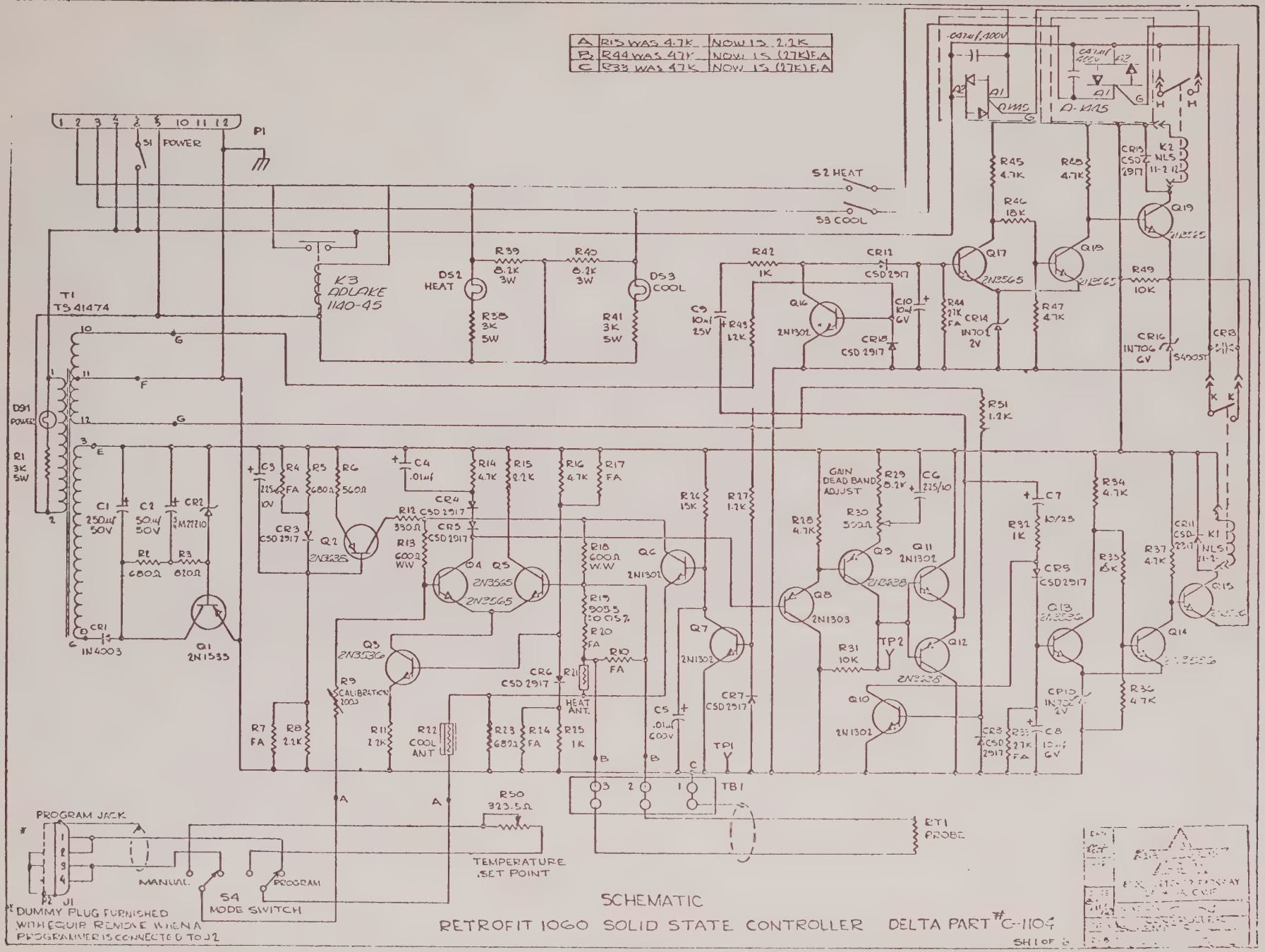
NOTE: TRIAC SWITCHES MAY BE SUPPLIED AS TWO A-1445 PRINTED CIRCUIT ASSEMBLIES, OR AS ONE A-1436 DUAL ASSEMBLIES.

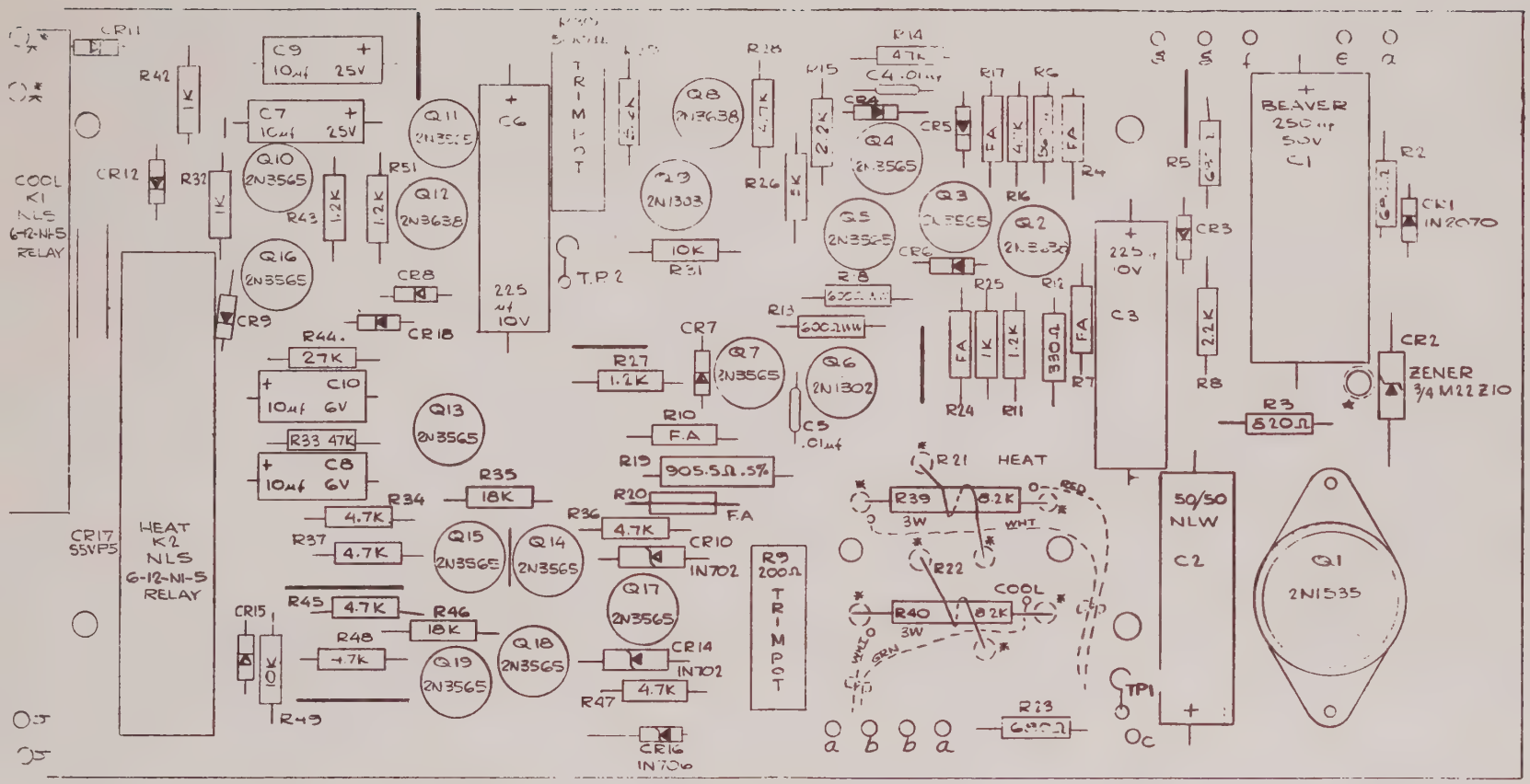


SCHEMATIC

RETROFIT 1060 SOLID STATE CONTROLLER DELTA PART #C-1103

SH 1 OF 6


A R15 WAS 4.7K NOW IS 2.2K
B R44 WAS 47K NOW IS (27K)FA
C R33 WAS 47K NOW IS (27K)FA
P1
S1 POWER
S2 HEAT
S3 COOL
T1
TS 41474
K3
ADLAKE
1140-45
DS1 POWER
DS2 HEAT
DS3 COOL
R1 3K 5W
R38 3K 5W
R41 3K 5W
R39 8.2K 3W
R40 8.2K 3W
C1 250uf 50V
C2 50uf 50V
CR2 MZ710
R2 680Ω
R3 820Ω
CR1 IN4003
Q1 2N1535
C3 225/10V
R4 FA
R5 680Ω
R6 560Ω
CR3 CSD 2917
Q2 2N3638
C4 .01uf
R12 330Ω
CR4 CSD 2917
CR5 CSD 2917
R13 600Ω WW
Q4 Q5 2N3565
R14 4.7K
R15 2.2K
R16 4.7K
R17 FA
R18 600Ω W.W
Q6 2N1302
R19 905Ω 1% CS7
R20 FA
R10 FA
Q3 2N3536
R9 CALIBRATION 200Ω
CR6 CSD 2917
R21 HEAT ANT.
R7 FA
R8 2.2K
R11 2.2K
R22 COOL ANT
R23 680Ω
R24 FA
R25 1K
C5 .01uf 600V
Q7 2N1302
CR7 CSD 2917
TP1
R26 15K
R27 1.2K
R50 323.5Ω
TEMPERATURE SET POINT
TB1
RT1 PROBE
R42 1K
CR11 CSD 2917
C9 10uf 25V
R43 12K
Q16 2N1302
C10 10uf 6V
CR12 CSD 2917
R44 21K FA
CR14 IN701 2V
R45 4.7K
R46 18K
Q17 2N3565
R48 4.7K
Q18 2N3565
R47 4.7K
R49 10K
CR13 CSD 2917
K2 NLS 11-2 12
Q19 2N3565
CR16 IN706 6V
S4005T
CR8
R51 1.2K
GAIN DEAD BAND ADJUST
R29 8.2K
C6 225/10
R30 500Ω
R28 4.7K
Q9 2N3638
Q11 2N1302
Q8 2N1303
R31 10K
TP2
Q12 2N3638
Q10 2N1302
C7 10/25
R32 1K
CR9 CSD 2917
R33 27K FA
C8 10uf 6V
CR15 IN706 6V
R34 4.7K
R35 15K
R36 4.7K
R37 4.7K
CR11 CSD 2917
K1 NLS 11-2
Q13 2N3638
Q14 2N3638
PROGRAM JACK
P2 J1
MANUAL
PROGRAM
S4 MODE SWITCH
* DUMMY PLUG FURNISHED WITH EQUIP. REMOVE WHEN A PROGRAMMER IS CONNECTED TO J2
SCHEMATIC
RETROFIT 1060 SOLID STATE CONTROLLER DELTA PART # C-1104
SH 1 OF 6



4. ALL WIRE [illegible] BE #22 TEFLON
3. Q4 & Q5 ARE A MATCHED PAIR
2. ★ INDICATES STAND OFF CTC 1300-10

1. ✱ INDICATES CASTELLATED TERM.
   [illegible] 1010-2 (10 PLCS)
NOTES:

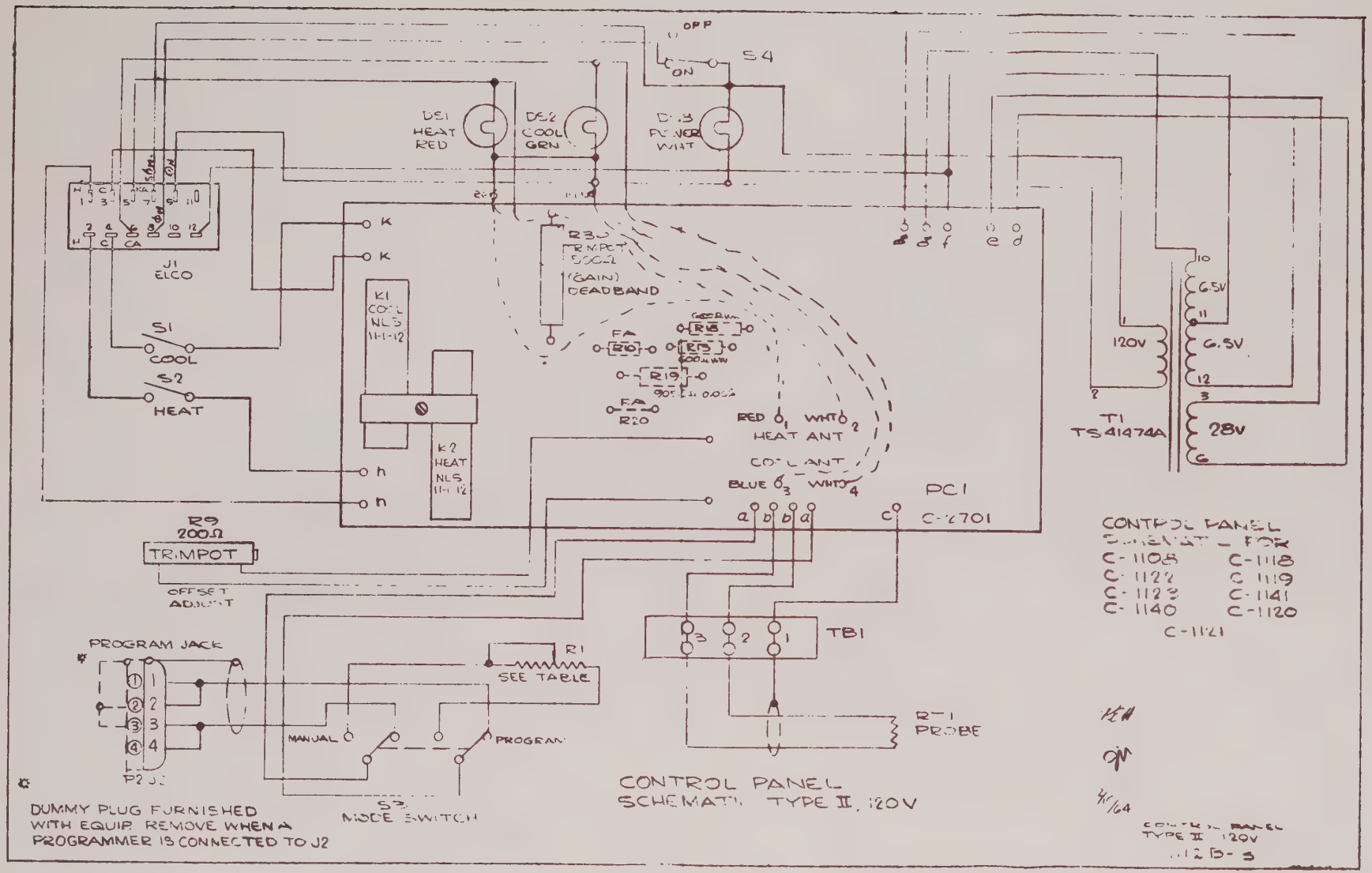
C2701 & A-1059

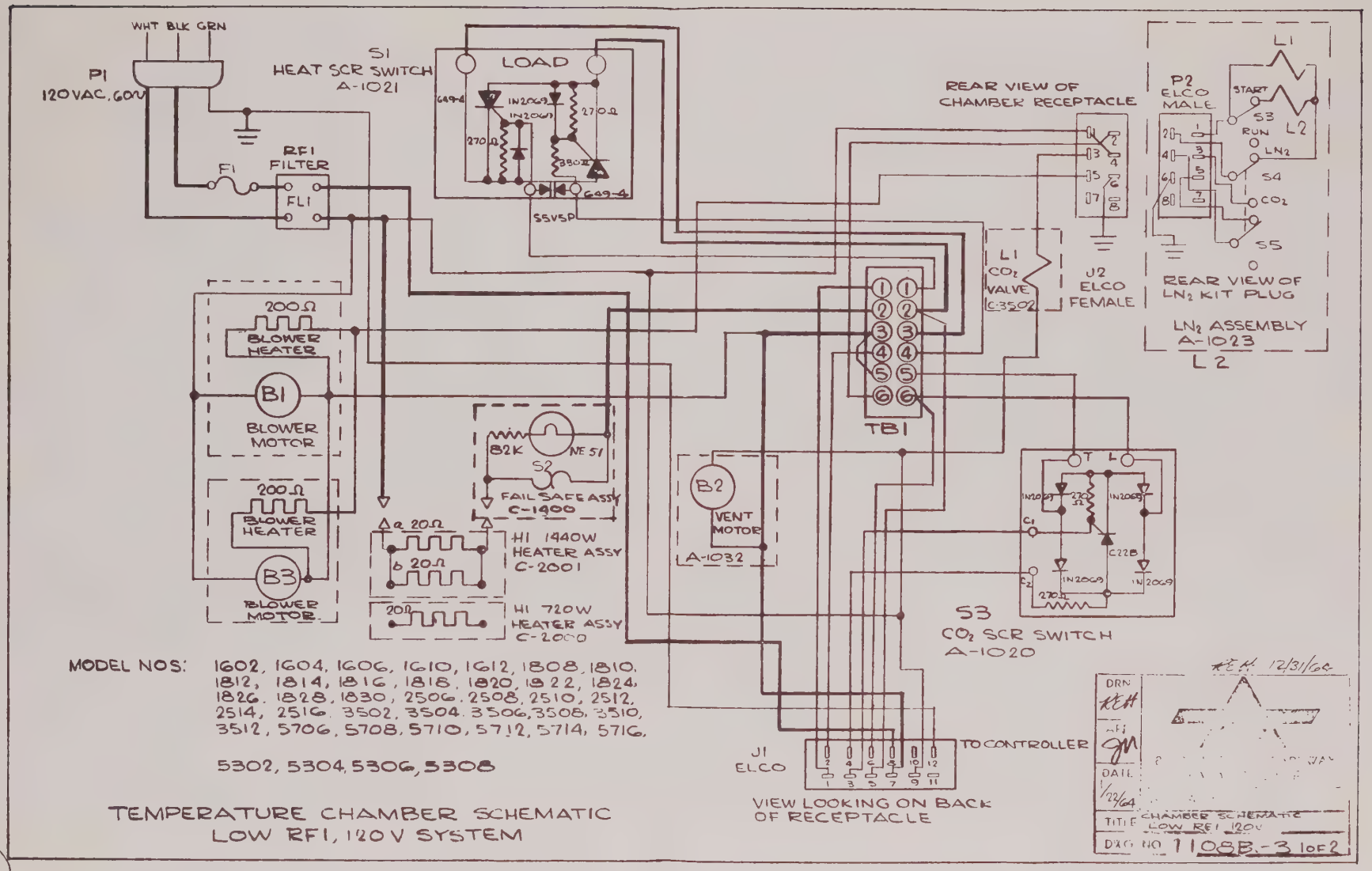
SERIAL Nº 53[illegible] & ON

SH: 2 OF 2

PARTS LAYOUT FOR C2701 & A-1059

1113B-3


OFF
ON
S4
DS1 HEAT RED
DS2 COOL GRN
DS3 POWER WHT
J1 ELCO
S1 COOL
S2 HEAT
K1 COOL NLS 11-1-12
K2 HEAT NLS 11-1-12
R3 TRIMPOT 500Ω (GAIN) DEADBAND
R18
R17
R16
R19
R20
FA
RED 1 WHT 2 HEAT ANT
COOLANT
BLUE 3 WHT 4
PC1 C-1701
T1 TS41474A
120V
6.5V
28V
R9 200Ω TRIMPOT
OFFSET ADJUST
PROGRAM JACK
P2 J2
R1 SEE TABLE
MANUAL
PROGRAM
S3 MODE SWITCH
TB1
RT1 PROBE
DUMMY PLUG FURNISHED WITH EQUIP. REMOVE WHEN A PROGRAMMER IS CONNECTED TO J2
CONTROL PANEL SCHEMATIC TYPE II, 120V
CONTROL PANEL SCHEMATIC FOR
C-1108 C-1118
C-1122 C-1119
C-1123 C-1141
C-1140 C-1120
C-1121
4/1/64
CONTROL PANEL TYPE II 120V
112B-3



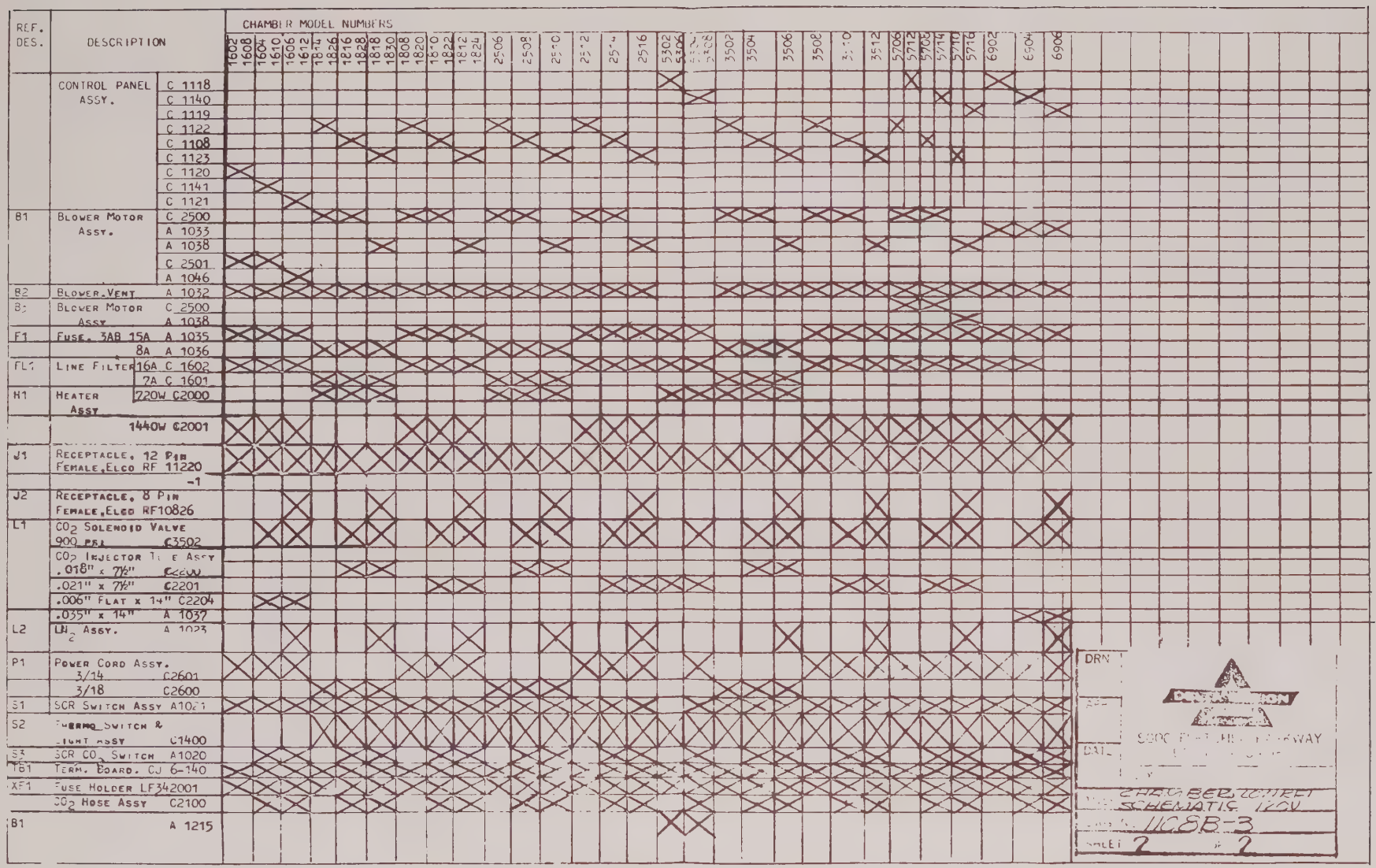
MODEL NOS: 1602, 1604, 1606, 1610, 1612, 1808, 1810, 1812, 1814, 1816, 1818, 1820, 1822, 1824, 1826, 1828, 1830, 2506, 2508, 2510, 2512, 2514, 2516, 3502, 3504, 3506, 3508, 3510, 3512, 5706, 5708, 5710, 5712, 5714, 5716,

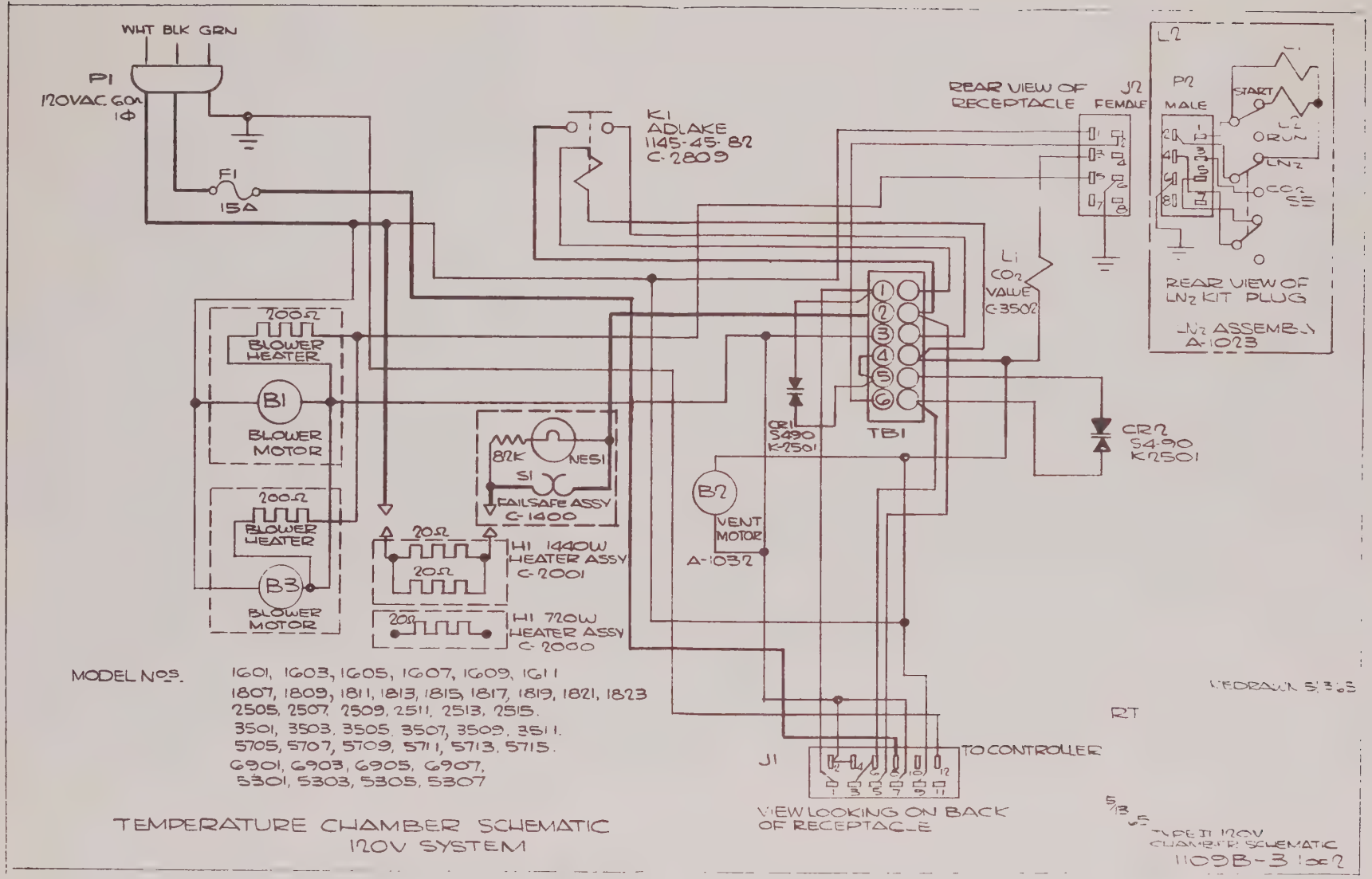
5302, 5304, 5306, 5308

TEMPERATURE CHAMBER SCHEMATIC
LOW RFI, 120V SYSTEM

KEH 12/31/63

(8)


REF. DES.
DESCRIPTION
CHAMBER MODEL NUMBERS
1602 1608 1604 1610 1606 1612 1814 1826 1816 1828 1818 1830 1808 1820 1810 1822 1812 1824 2506 2508 2510 2512 2514 2516 5302 5306 5308 3502 3504 3506 3508 3510 3512 5706 5712 5708 5714 5710 5716 6902 6504 6906
CONTROL PANEL ASSY. C 1118 C 1140 C 1119 C 1122 C 1108 C 1123 C 1120 C 1141 C 1121
B1 BLOWER MOTOR ASSY. C 2500 A 1033 A 1038 C 2501 A 1046
B2 BLOWER, VENT A 1032
B3 BLOWER MOTOR ASSY A 1038
F1 FUSE, 3AB 15A A 1035 8A A 1036
FL1 LINE FILTER 16A C 1602 7A C 1601
H1 HEATER ASSY 720W C2000 1440W C2001
J1 RECEPTACLE, 12 PIN FEMALE, ELCO RF 11220 -1
J2 RECEPTACLE, 8 PIN FEMALE, ELCO RF10826
L1 CO2 SOLENOID VALVE 900 PSI C3502
CO2 INJECTOR TUBE ASSY .018" x 7½" C2200
.021" x 7½" C2201
.006" FLAT x 14" C2204
.035" x 14" A 1037
L2 LN2 ASSY. A 1023
P1 POWER CORD ASSY. 3/14 C2601 3/18 C2600
S1 SCR SWITCH ASSY A1021
S2 THERMO SWITCH & LIGHT ASSY C1400
S3 SCR CO2 SWITCH A1020
TB1 TERM. BOARD. CJ 6-140
XF1 FUSE HOLDER LF342001
CO2 HOSE ASSY C2100
B1 A 1215
DRN
APP
DATE
SCHEMATIC ICCV
ICCB-3
SHEET 2 OF 2

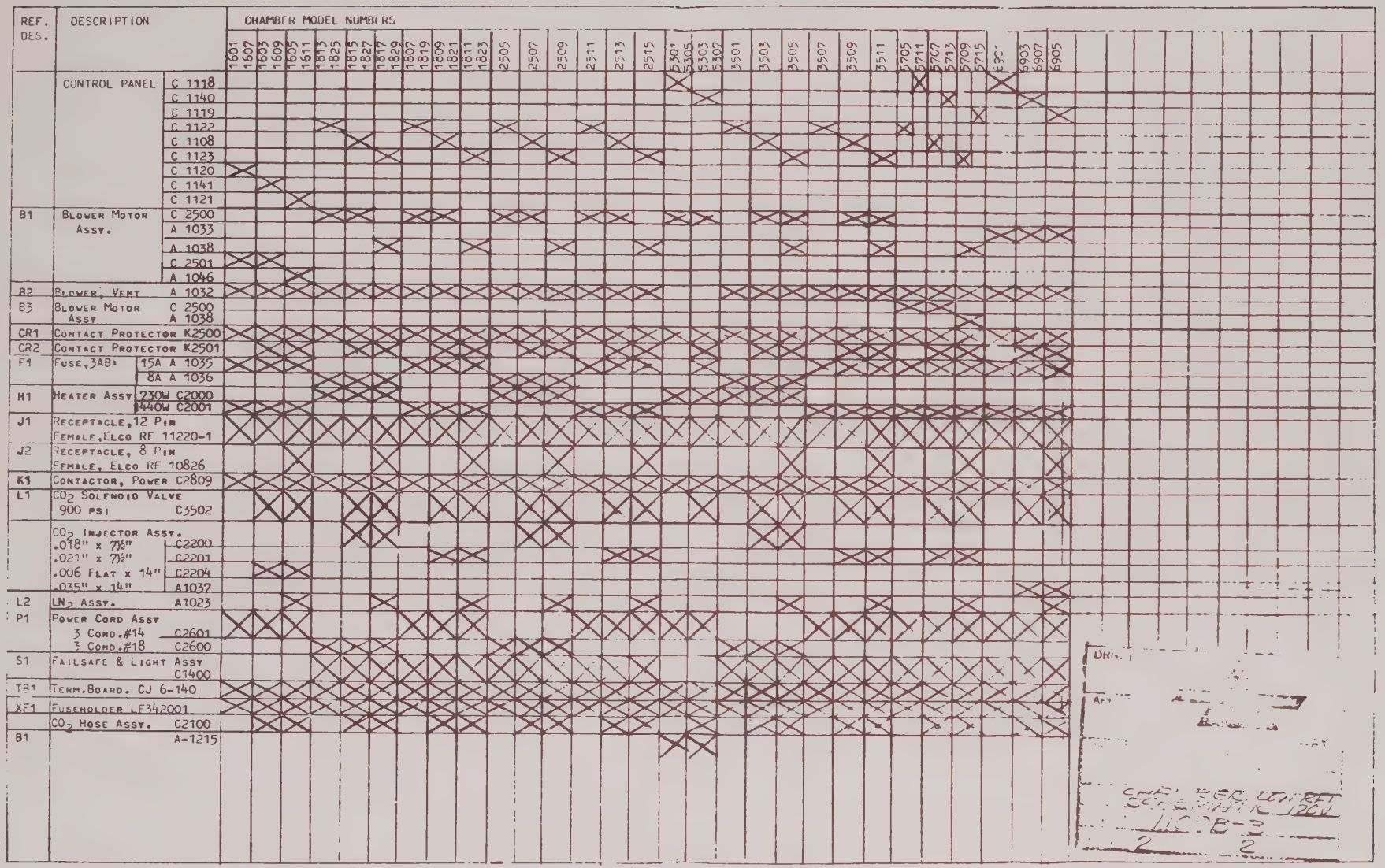


MODEL NOS. 1601, 1603, 1605, 1607, 1609, 1611
1807, 1809, 1811, 1813, 1815, 1817, 1819, 1821, 1823
2505, 2507, 2509, 2511, 2513, 2515.
3501, 3503, 3505, 3507, 3509, 3511.
5705, 5707, 5709, 5711, 5713, 5715.
6901, 6903, 6905, 6907,
5301, 5303, 5305, 5307

REDRAWN 5/3/85

TEMPERATURE CHAMBER SCHEMATIC 120V SYSTEM

5/13/85 TYPE II 120V CHAMBER SCHEMATIC 1109B-31 REV 2


REF. DES.
DESCRIPTION
CHAMBER MODEL NUMBERS
1601 1607 1603 1609 1605 1611 1813 1825 1815 1827 1817 1829 1807 1819 1809 1821 1811 1823 2505 2507 2509 2511 2513 2515 5301 5305 5303 5307 3501 3503 3505 3507 3509 3511 5705 5711 5707 5713 5709 5715 FE35 6903 6907 6905
CONTROL PANEL C 1118
C 1140
C 1119
C 1122
C 1108
C 1123
C 1120
C 1141
C 1121
B1 BLOWER MOTOR ASSY. C 2500
A 1033
A 1038
C 2501
A 1046
B2 BLOWER, VENT A 1032
B3 BLOWER MOTOR ASSY C 2500
A 1038
CR1 CONTACT PROTECTOR K2500
CR2 CONTACT PROTECTOR K2501
F1 FUSE, 3AB 15A A 1035
8A A 1036
H1 HEATER ASSY 730W C2000
1440W C2001
J1 RECEPTACLE, 12 PIN FEMALE, ELCO RF 11220-1
J2 RECEPTACLE, 8 PIN FEMALE, ELCO RF 10826
K1 CONTACTOR, POWER C2809
L1 CO_2 SOLENOID VALVE 900 PSI C3502
CO_2 INJECTOR ASSY.
.018" x 7½" C2200
.021" x 7½" C2201
.006 FLAT x 14" C2204
.035" x 14" A1037
L2 LN_2 ASSY. A1023
P1 POWER CORD ASSY
3 COND. #14 C2601
3 COND. #18 C2600
S1 FAILSAFE & LIGHT ASSY C1400
TB1 TERM. BOARD. CJ 6-140
XF1 FUSEHOLDER LF342001
CO_2 HOSE ASSY. C2100
B1 A-1215

PARTS LIST

TITLE: NARROW BOARD, TYPE 2 AMPLIFIER, P.C. BOARD ASSEMBLY

SERIAL NO. 5206 & ON
DELTA C-2701 & A-1019

DWG. NO. 1113A-4
SHT. 1 OF 5

DELTA DESIGN, INC. LA MESA, CALIF.

APPD. DATE

ITEM NO.	REF. DES.	NO. REQD.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PART NO.	
1			SALES OUTLINE				
2			MECHANICAL ASSEMBLY				
3			SCHEMATIC	2 OF 2 SHT.			
4			PARTS LIST	5 OF 5 SHTS.			
5			WIRING SCHEDULE				
6			WIRING DIAGRAM				
7			MECH. & ELECT. ASSY				
8	K1	1	RELAY	NLS6-12-N1-5	NON LINEAR	A 1244	
9	K2	1	RELAY	NLS6-12-N1-5	NON LINEAR	A 1244	
10	PC1	1	PRINTED CIRCUIT BOARD	1069-10	DELTA DESIGN		
11	C1	1	CAPACITOR, ELECTROLYTIC 250MF, 50V	BR 250/50	CORNELL DUBILIER	K 1100	
12	C2	1	CAPACITOR, ELECTROLYTIC 50 MF/50V	NLW 50/50	CORNELL DUBILIER		
13	C3	1	CAPACITOR, ELECTROLYTIC 225MF/ 10V	NLW 225/10	CORNELL DUBILIER		
14	C4	1	CAPACITOR, DISC	.01MF, 600V	CENTRALAB		
15	C5	1	CAPACITOR, DISC	.01MF, 600V	CENTRALAB		
16	C6	1	CAPACITOR, ELECTROLYTIC 225MF, 10V	NLW 225/10	CORNELL DUBILIER		
17	C7	1	CAPACITOR, ELECTROLYTIC 10MF, 25V	NLW 10/25	CORNELL DUBILIER		
18	C8	1	CAPACITOR, ELECTROLYTIC 10MF, 6V	NLW 10/6	CORNELL DUBILIER		
19	C9	1	CAPACITOR, ELECTROLYTIC 10MF, 25V	NLW 10/25	CORNELL DUBILIER		
20	C10	1	CAPACITOR, ELECTROLYTIC 10MF, 6V	NLW 10/6	CORNELL DUBILIER		
21	R2	1	RESISTOR COMP.	680 OHMS, ½W, 5%	OHMITE		
22	R3	1	RESISTOR COMP.	820 OHMS, ½W, 5%	OHMITE		
23	R4	1	RESISTOR COMP.	F.A. ½W, 5%	OHMITE		
24	R5	1	RESISTOR COMP.	680 OHMS, ½W, 5%	OHMITE		
25	R6	1	RESISTOR COMP.	560 OHMS, ½W, 5%	OHMITE		

PARTS LIST.

DWG. NO. 1113A-4

TITLE NARROW BOARD, TYPE 2 SERIAL NO. 5206 & ON
WIDE BOARD WITH CO2 DRIVE DELTA C 2701 & A 1059

SHT. 2 OF 5

DELTA DESIGN, INC. L.A. MESA, CALIF. DATE: MAR.

ITEM NO.	SYMBOL NO.	QTY. REQ.	DESCRIPTION	COML. PT. NO.	MFR.	REV. LTR.
26	R7	1	RESISTOR COMP.	F.A. ½W,5%	OHMITE	
27	R8	1	RESISTOR COMP.	2.2K,½W,5%	OHMITE	
28	R9	1	POTENTIOMETER TRIMPOT 200 OHMS, 20 TURNS	275-1-201	BOURNS	C 3800
29	R10	1	RESISTOR COMP.	F.A.½W,5%	CONRAD CARLSON	
30	R11	1	RESISTOR COMP.	1.2K,½W,5%	OHMITE	
31	R12	1	RESISTOR COMP.	330 OHMS,½W,5%	OHMITE	
32	R13	1	RESISTOR, WIRE WOUND	600 OHMS,W.W.1%	CONRAD CARLSON	
33	R14	1	RESISTOR COMP.	4.7K,½W,5%	OHMITE	
34	R15	1	RESISTOR COMP.	2.2K,½W,5%	OHMITE	
35	R16	1	RESISTOR COMP.	4.7K,½W,5%	OHMITE	
36	R17	1	RESISTOR COMP.	F.A.½W,5%	OHMITE	
37	R18	1	RESISTOR, WIRE WOUND	600 OHMS, 1%	CONRAD CARLSON	
38	R19	1	RESISTOR, WIRE WOUND	905.5 OHMS .05%	CONRAD CARLSON	
39	R20	1	RESISTOR, WIRE WOUND	F.A. ½W,5%	CONRAD CARLSON	
40	R21	1	RESISTOR, HEAT ANT.	F.A.	DELTA DESIGN	
41	R22	1	RESISTOR, COOL ANT.	F.A.	DELTA DESIGN	
42	R23	1	RESISTOR COMP.	680 OHMS,½W,5%	OHMITE	
43	R24	1	RESISTOR COMP.	F.A. ½W,5%	OHMITE	
44	R25	1	RESISTOR COMP.	1K,½W,5%	OHMITE	
45	R26	1	RESISTOR COMP.	15K ½W,5%	OHMITE	
46	R27	1	RESISTOR COMP.	1.2K,½W,5%	OHMITE	
47	R28	1	RESISTOR COMP.	4.7K,½W,5%	OHMITE	
48	R29	1	RESISTOR COMP.	5.6K,½W,5%	OHMITE	
49	R30	1	POTENTIOMETER, WIRE WOUND 500 OHMS, 20 TURNS	275-1-501	OHMITE	

PARTS LIST

DWG. NO. 1113A-4

SHT. 3 OF 5

TITLE AMPLIFIER, P.C. BOARD ASSEMBLY DELTA C 2701 & A 1059
NARROW BOARD, TYPE 2 SERIAL NO. 5206 & ON

DELTA DESIGN, INC. LA MESA, CALIF.

APPD. DATE

ITEM NO.	REF. DES.	QTY. REQ'D.	DESCRIPTION	COML. PT. NO.	M'F'R.	DELTA PART NO.
50	R31	1	RESISTOR COMP.	10K, ½W, 5%	OHMITE	
51	R32	1	RESISTOR COMP	1K, ½W, 5%	OHMITE	
52	R33	1	RESISTOR COMP. F.A.	27K, ½W, 5%	OHMITE	
53	R34	1	RESISTOR COMP.	4.7K, ½W, 5%	OHMITE	
54	R35	1	RESISTOR COMP	18K, ½W, 5%	OHMITE	
55	R36	1	RESISTOR COMP	4.7K, ½W, 5%	OHMITE	
56	R37	1	RESISTOR COMP.	4.7K, ½W, 5%	OHMITE	
57	R39	1	RESISTOR 8.2K, 3W	4451	OHMITE	
58	R40	1	RESISTOR 8.2K, 3W	4451	OHMITE	
59	R42	1	RESISTOR COMP.	1K, ½W, 5%	OHMITE	
60	R43	1	RESISTOR COMP.	1.2K, ½W, 5%	OHMITE	
61	R44	1	RESISTOR COMP., F.A.	27K, ½W, 5%	OHMITE	
62	R45	1	RESISTOR COMP.	4.7K, ½W, 5%	OHMITE	
63	R46	1	RESISTOR COMP.	18K, ½W, 5%	OHMITE	
64	R47	1	RESISTOR COMP.	4.7K, ½W, 5%	OHMITE	
65	R48	1	RESISTOR COMP.	4.7K, ½W, 5%	OHMITE	
66	R49	1	RESISTOR COMP.	10K, ½W, 5%	OHMITE	
67	R51	1	RESISTOR COMP.	1.2K, ½W, 5%	OHMITE	
70	Q1	1	TRANSISTOR	2N1535	MOTOROLA	
71	Q2	1	TRANSISTOR	2N3638	FAIRCHILD	
72	Q3	1	TRANSISTOR	2N3565	FAIRCHILD	
73	Q4	1	TRANSISTOR	2N3565	"	
74	Q5	1	TRANSISTOR	2N3565	"	

PARTS LIST

DWG. NO. 1113A-4

TITLE AMPLIFIER, P.C. BOARD ASSEMBLY DELTA C 2701 & A 1059
NARROW BOARD, TYPE 2

SHT. 4 OF 5

DELTA DESIGN, INC. LA MESA, CALIF.

APP'D. DATE

SHT. NO.	REF. DES.	NO. REQ'D.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PART NO.	
75	Q6	1	TRANSISTOR	2N1302	TEXAS INST.		
76	Q7	1	TRANSISTOR	2N3565	FAIRCHILD		
77	Q8	1	TRANSISTOR	2N3638	"		
78	Q9	1	TRANSISTOR	2N3638	"		
79	Q10	1	TRANSISTOR	2N3565	"		
80	Q11	1	TRANSISTOR	2N3565	"		
81	Q12	1	TRANSISTOR	2N3638	"		
82	Q13	1	TRANSISTOR	2N3565	"		
83	Q14	1	TRANSISTOR	2N3565	"		
84	Q15	1	TRANSISTOR	2N3565	"		
85	Q16	1	TRANSISTOR	2N3565	"		
86	Q17	1	TRANSISTOR	2N3565	"		
87	Q18	1	TRANSISTOR	2N3565	"		
88	Q19	1	TRANSISTOR	2N3565	"		
89	CR1	1	DIODE	1N2069	SEMICON	K 1400	
90	CR2	1	DIODE, ZENER	ZM22Z10	MOTOROLA		
91	CR3	1	DIODE, 50V, PIV	1N4001	"	A 1235	
92	CR4	1	DIODE, 50V, PIV	1N4001	"	A 1235	
93	CR5	1	DIODE 50V, PIV	1N4001	"	A 1235	
94	CR6	1	DIODE 50V, PIV	1N4001	"	A 1235	
95	CR7	1	DIODE 50V, PIV	1N4001	"	A 1235	
96	CR8	1	DIODE 50V, PIV	1N4001	"	A 1235	
97	CR9	1	DIODE 50V, PIV	1N4001	"	A 1235	
98	CR10	1	DIODE, ZENER	1N702	DIXON		
99	CR11	1	DIODE 50V PIV	1N4001	MOTOROLA	A 1235	

PARTS LIST

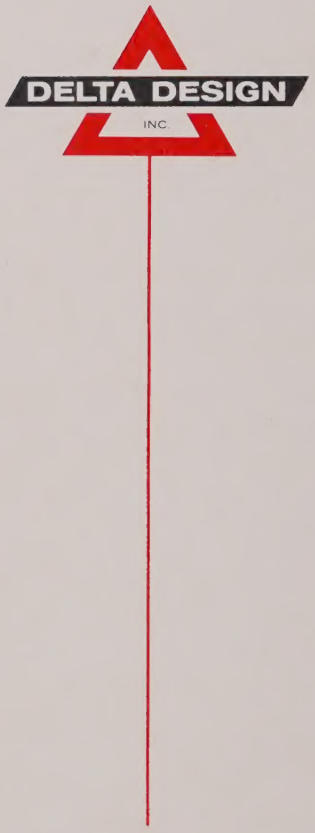
TITLE: AMPLIFIER, P.C. BOARD ASSEMBLY DELTA DESIGN C 2701 & A 1059
NARROW BOARD, TYPE 2

DWG. NO. 1113A-4
SHT. 5 OF 5

DELTA DESIGN, INC. LA MESA, CALIF.

APP'D. DATE

DASH NO.	REF DES	NO. REQ'D	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PART NO.
• 100	CR12	1	DIODE 50V, PIV	1N4001	MOTOROLA	A 1235
• 101	CR13	1	DIODE 50V, PIV	1N4001	"	A 1235
102	CR14	1	DIODE, ZENER	1N702	DIXON	
103	CR15	1	DIODE 50V PIV	1N4001	MOTOROLA	A 1235
104	CR16	1	DIODE	1N702	DIXON	
			*ALL ASTERIK PARTS TO BE OMITTED FOR A 1059 ASSEMBLY			



SAN DIEGO, CALIFORNIA

MP MASTER
MA32454